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Teachers' Metacognition Development in a Professional Training Context

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Abstract: This study aims to evaluate the development of teachers' metacognition in the professional education of nurses and health technicians in science. The contribution of this study is to study the development of metacognition during each of the three phases of the teaching/learning cycle and to describe the methods adopted for this purpose. In this context, it seems necessary to specify that integrating the competency-based approach in the teaching/learning process require a new paradigm centered on the learner. This opens up a pedagogical issue that raises concerns about the development of metacognition in students as a pathway to self-directed learning. Metacognition has considerable potential to help teachers build an environment that organizes students in strategic learning. They are invited to design and adopt pedagogical practices that focus on metacognitive development adjusted to the learning process's cognitive, affective, and social aspects. In the Moroccan context, particularly at the Institut Supérieur des Professions Infirmières et des Techniques de Santé in Fez, the problem of metacognitive development by teachers stems from a real observation that alerts us to the inadequacies of its continuous integration into teaching practice. For this reason, the objective of this quantitative retrospective descriptive study is to explore the development of metacognition by teachers in their practice. A questionnaire was administered to respondents. The results highlighted gaps in adherence to the different stages of metacognitive development, including modeling, guided, collaborative, and independent practice. Thus, recommendations are made to improve teachers' skills in this area.

Keywords: metacognition, teaching/learning, modeling, guided practice, cooperative practice, autonomous practice.

教师在专业培训中的元认知发展

摘要: 本研究旨在评价教师元认知在护士和卫生技术人员科学专业教育领域的发展。本研究的贡献是在教学/学习周期的三个阶段中的每一个阶段研究元认知的发展,并说明为此目的采用的方法。在这种情况下,似乎有必要具体说明,将基于能力的方法纳入教学过程需要以学习者为中心的新范式。这就打开了一个教学问题,引起了人们对元认知发展作为自我指导学习途径的担忧。元认知有相当大的潜力帮助教师建立一个组织学生进行战略学习的环境。他们被邀请设计和采用注重元认知发展的教学实践,以适应学习过程的认知、情感和社会方面。在摩洛哥的情况下,特别是在费斯的高等医学和技术学院,教师的元认知发展问题源于一种真实的观察,这种观察提醒我们,教师在继续融入教学实践方面存在不足。为此,

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本定量回顾性描述研究的目的是探讨教师元认知在实践中的发展。向答复者发放了一份问卷。结果突出显示了在遵循元认知开发的不同阶段（包括建模、引导、合作和自主实施）方面存在的差距。因此，建议提高教师在这方面的技能。

关键词：元认知、教学/学习、建模、指导实践、合作实践、自主实践。

1. Introduction

The teacher-centered teaching paradigm has been replaced by the student-centered learning paradigm [1]. In this new pedagogical context, metacognitive activities are becoming more and more effective [2, 3, 4] since they allow students to be aware of all the mental activities and manage their progress [5].

Teachers are subsequently invited to become autonomous actors capable of adapting to all situations by analyzing their practices [6]. At the same time, they must strive to foster the development of reflective skills and autonomy in their students by constantly inviting them to a metacognitive exercise [7].

In this respect, [8] explains that there is currently a strong interest in metacognition within training as long as the quality of the individual's professional and social integration is closely linked to the quality of introspective learning. In this sense, a series of studies show the importance of interventions that focus on metacognition, including planning, control, and regulation skills and learning strategies [9]. Similarly, [10] points out that metacognitive development is a gradual process of internalization and personalization through social interactions.

According to [11], this process of internalization goes through four stages: (a) the teacher, as an expert, offers a model, (b) this model invites the novice, as a student, to take its place in the task, (c) the novice is encouraged to take initiatives and (d) the novice manages the activity alone. Based on this classification, [12] associate the first stage with modeling and the second and third stages with guided practice. Meanwhile, these authors add collaborative practice and the fourth stage to autonomous practice.

On another level, it must be noted that vocational training, as a component of human development, is nowadays a challenge in acquiring the expertise and skills needed to master new technologies and access the information [13].

Metacognitive strategies must be made explicit; in other words, the teacher must make his or her student aware of his or her cognitive approaches and able to develop the ability to autonomously manage the various metacognitive functions necessary to accomplish various instructional tasks such as problem-solving, planning, and controlling emotions [14].

Some teachers note that they find it difficult to verbalize the mental process from their students. In this

case, they will not have access to their students' mental processes and cannot help them improve their approaches through instructions adapted to the personal management of their mental activity [15].

The development of metacognition as a theme remains insufficiently addressed in professional education, especially in nursing. Its optimal understanding remains dependent on exploring the different Teaching/Learning methods teachers use for this purpose. In this respect, this study aims to examine the development of metacognition by teachers at the Higher Institute of Nursing Professions and Health Techniques (ISPITS) in Fez in the practice of Teaching/Training.

1.1. Context

The ISPITS teaching staff provides theoretical and practical instructions and mentoring for internship students. It assesses students' knowledge, skills, and attitudes. Teachers participate in guiding and assessing the research work that students carry out. In addition, they contribute to accomplishing any other educational activity organized by the Institution's administration and may be called to participate in some educational sessions organized by the Institution.

2. Theoretical Framework

2.1. Planning Metacognitive Activities

While planning for the learning activities, the teacher should use a pedagogical approach and teaching strategies that take into account metacognition [16]. In this sense, [17] suggests that time should first be allowed to take metacognitive breaks during an activity so that students become aware of their metacognitive experiences and the mental mechanisms they implement.

The same author considers the "metacognitive pause" relatively appropriate to reflect the need to help students improve their abilities to develop efficient learning strategies. In addition, pedagogical practices oriented toward metacognitive development must be planned in such a way to ensure that they are part of the continuity of the classroom activities and not only adopted in isolation [11].

In other words, the student may tend to consider that consciousness and control of thought are only useful in a few specific contexts [12]. On the other

hand, the teacher should carefully choose the methods to use since some pedagogical methods such as cooperative teamwork, group discussion, and games and simulations are more effective than other methods in achieving metacognitive objectives [14].

In this way, concept diagrams or graphic representations are presented as visual representations of verbal statements [7, 9]. The teacher can suggest metacognitive activities performed by a student alone in small groups or the whole group [3].

2.2. The Implementation of Metacognition Development Activities

In this respect, when facilitating a teaching/learning session, [8] consider that the teacher can also play the role of a guide to develop metacognition. This will necessarily go through four stages: modeling, guided, cooperative, and autonomous. [8] explain that it is important for the teacher to activate the students' prior knowledge about how they plan the task to be performed before modeling. Then, by inviting them to compare their approach with that of their peers, the teacher encourages the necessary conflict for the student to feel the need to validate or adjust his or her approach. They also add that the answer(s) to the question(s) or problems to the related modeling should be provided to students. The main goal is to focus on the process; otherwise, they will spend most of their time looking for the right answer. The second stage (guided practice) [8] argues that it is in this stage where students are invited to verbalize their way of doing things.

In other words, [14] assumes that teachers play two important roles during this stage: a coaching role and a scaffolding role. For the teacher, it is a matter of anticipating the kind of questions that allow students to adjust or refine their approach to make it metacognitive.

This is to say, to discover how and in what ways students can manage it to feel that a sense of competence is growing by constantly self-assessing themselves [8]. Meanwhile, [14] points out that guided practice requires teachers to have the ability to diagnose gaps in the student's problem-solving process and an understanding of the level of support needed to guide students to independent practice. The third step is the collaborative practice that reminds us of the reciprocal teaching aims. The students, placed in pairs, are invited in turn to explain to their partners their entire thought process to synthesize their text or apply a problem-solving strategy [8].

In this way, [14] suggests that the collaborative practice should provide the student with an opportunity to solve problems without the constant assistance of the teacher, but not without supervision. In this respect, the student might count on the teacher's support if necessary in an environment of exchange and discussion with peers. As a final step, the teacher will

only move from collaborative practice to the fourth step -autonomous practice- once he or she is sure that students have reached a high level of mastery of the subject to be learned, as explained by [2]. According to these authors, achieving a high level of knowledge mastery through multiple practice opportunities improves students' organization in long-term memory to bring their autonomy, thus facilitating their retention and eventual recall.

2.3. Metacognition Development Evaluation

In the third phase of teaching/learning practice, the evaluation phase, the activities may require the teacher or students' judgment [9]. By evidence, questioning is indeed attached to metacognition. Though it is not innate, it should be taught to students [4]. In other words, questioning is a means of encouraging verbalization [6], explanation [5], or reflection on one's mental approach. In any case, questioning contributes to awareness. From a metacognitive perspective, learners could question themselves about the communication process [12].

The teacher can use various tools to stimulate the development of metacognition. To this end, the logbook appears to be an interesting, accessible, and above all appropriate tool to enable the learner to reflect on his or her learning. Many authors consider its use to encourage reflection on students' actions [3, 7, 13]. [10], for instance, it considers the logbook an instrument for personal exploration, clarification, and self-knowledge, which helps structure and shape our daily experiences. Metacognition can also be developed as part of the note-taking techniques learning, such as in the case of a study conducted at university by [8].

In addition, several authors agree that a concept map is also a metacognitive tool that facilitates the organization of knowledge [14] and encourages reflection [2]. Another tool that the teacher can use is the portfolio since the focus is on the product, process, and progress [4].

In this respect, [13] points out that the portfolio can facilitate the student's reflective practice as it encourages self-assessment that leads to a better knowledge of oneself. Similarly, [11] postulates that the portfolio allows students to self-evaluate their conceptions and representations of reality since they can build their knowledge through interacting with others, in health science training, [8] report that the pedagogical orientations underlying the use of the portfolio in an evaluation perspective focus fundamentally on professional development and metacognition. They explain this by the fact that the activities developed around the portfolio offer students the opportunity to make strong use of their previous knowledge to engage actively and independently in learning strategies in meaningful and motivating contexts and build skills from authentic professional

tasks. In this context, [12] argues that by strengthening self-evaluation, the teacher enables the student to make a personal judgment about controlling his/her resources and strategies.

Thus, the teacher encourages the students to develop metacognitive abilities and provides them with the attributes of learners who can manage themselves cognitively and emotionally, and this is by integrating students in a problem context [10].

3. Materials and Methods

3.1. Study Design and Environment

This is a quantitative descriptive retrospective study aiming to explore the development of metacognition by permanent teachers at ISPITS Fez in their teaching/learning practice.

The study environment is represented by the 'Institut Supérieure des Professions Infirmières et Techniques de Santé' (ISPITS) in Fez, Morocco. This choice is based on the accessibility and proximity of the environment, the size and availability of the teaching staff, and the heterogeneity regarding the training and experience of its members.

3.2. Population

The study population is composed of 34 permanent teachers of the ISPITS in Fez. Thus, a census gave 31 permanent teachers who were divided into three sections since the planning stage.

3.3. Instrumentation and Data Collection

The survey was conducted through a self-administered questionnaire distributed to teachers at the ISPITS in Fez. This flexible and practical methodological instrument generally reduces the required time to collect and process data. It allows the participants to feel more secure about the anonymity of the answers, which gives them the freedom to express their opinions. This questionnaire was composed of three sections dedicated to the three phases of Teaching/Learning to describe the different activities to develop metacognition.

After being tested and validated by ten teachers from the ISPITS in Taza, who have similar activities, the questionnaire was self-administered to all permanent teachers from the ISPITS in Fez. The questionnaire collection resulted in several respondents of 31 teachers and a 100% response rate.

4. Results

4.1. Planning Phase

Based on the results, feedback-communication is the teaching technique most used by teachers, with a percentage of 37.5%, as indicated in Figure 1 (a). In this way, 42% of the respondents revealed that the condition that seems to be the most difficult to consider

to create a favorable environment for metacognitive development (MD) is the establishment of metacognitive breaks, as displayed in Figure 1 (b). In addition, the same figure shows that only 26% of the teachers report that they find it difficult to promote "socio-metacognitive" conflict.

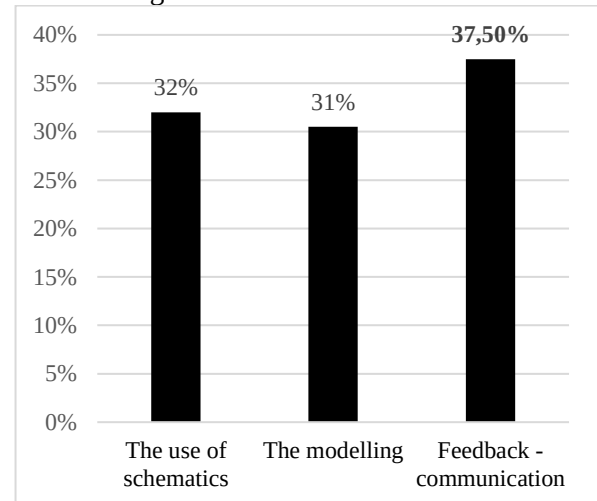


Fig. 1(a) Classification of the used teaching techniques

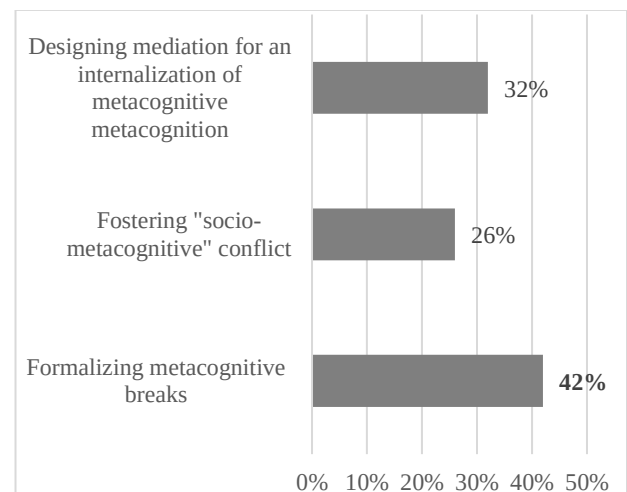


Fig. 1(b) Difficulties constraining the creation of metacognitive development (MD)

4.2. Animation Phase

For the animation stage, about 52% of teachers selected that lack of time is the main difficulty in modeling practice. However, just 12.5% of all participants confirmed no obstacles in this practice (Figure 2).

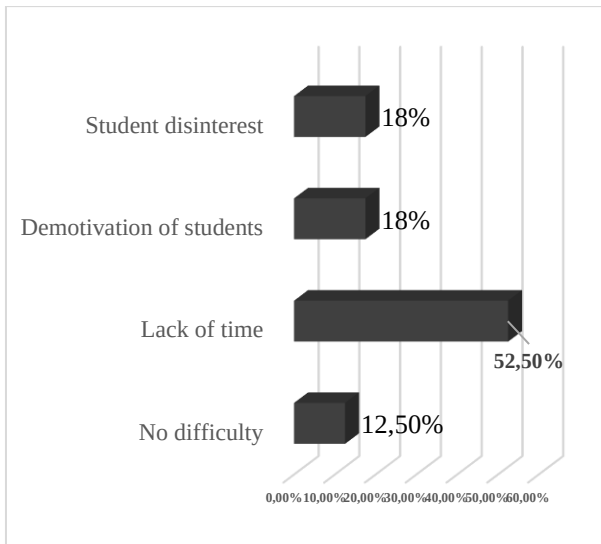


Fig. 2 The most common difficulties encountered during modeling according to teachers

In guided practice, 35% of teachers asked students to make summaries, and 31% asked them to anticipate the questions that allow students to adjust or refine their learning process. On the other hand, only 13% of these participants predicted learning difficulties (Figure 3).

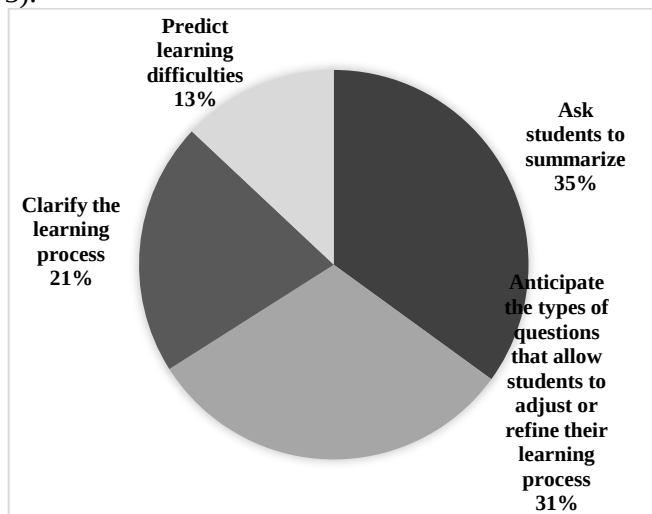


Fig. 3 Strategies adopted by respondents in guided practice

Meanwhile, during a group work activity that is part of collaborative practice, 32% of teachers said that they ask students to divide into sub-groups, 27% mentioned that they ask them to designate a leader from each sub-group, and 30% declared that they call the learner who observes or listens to take a critical look at the other's approach. On the other hand, only 11% of teachers asked leaders to use learning strategies and encouraged other subgroup members to use them (Figure 4).

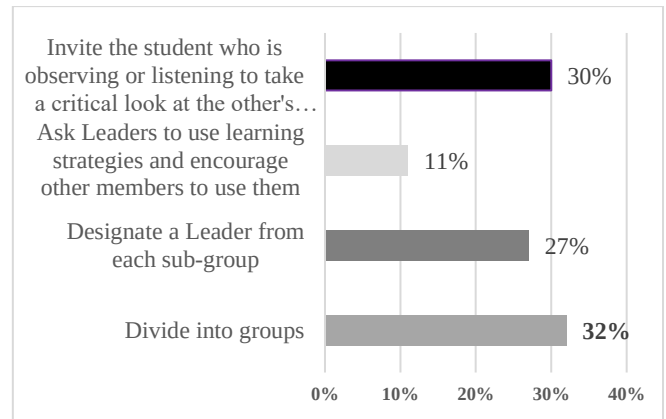


Fig. 4 Cooperative practice guidelines given in group work

Besides, the figure below (5) appears that all teachers target certain goals by achieving independent practice by their students. More than half of the respondents stated that they aim to achieve the three goals mentioned above with autonomy regarding students taking charge of their learning as the most targeted goal (Figure 5).

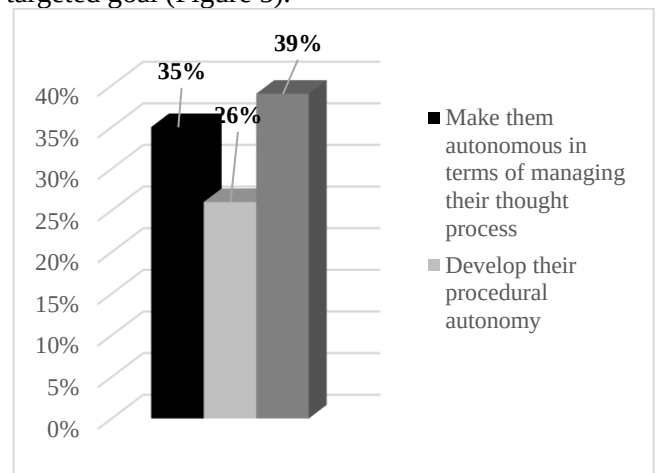


Fig. 5 Distribution of participants by purpose of independent practice

4.3. Evaluation Phase

For 52% of teachers, the evaluation of metacognition development in students is mainly carried out as part of a formative evaluation. Similarly, about 45% agreed that it is carried out as part of both types of evaluation (formative and summative), as indicated in Figure 6(a). In addition, only 3% reported using only the summative evaluation to assess students' metacognition development. On another level, almost half of teachers opt for note-taking as a widely used method in this context, followed by questioning. However, just 6% of the teachers use the logbook, as indicated in Figure 6(b).

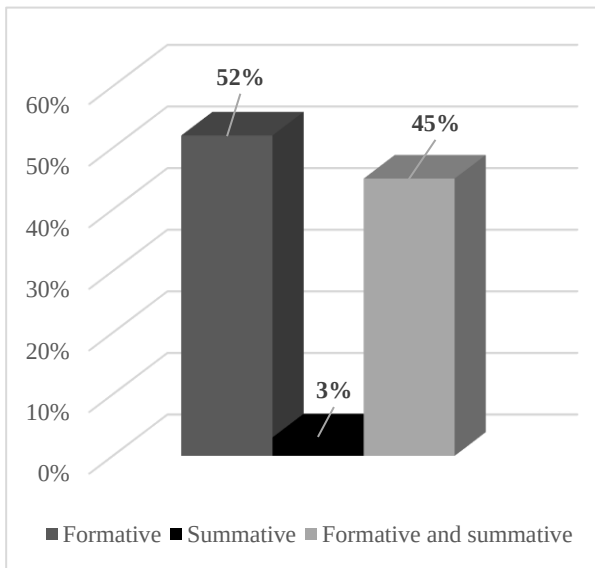


Fig. 6(a) The framework for the DM evaluation

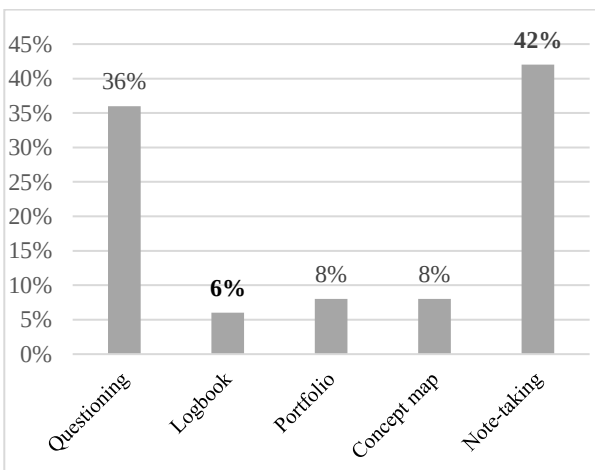


Fig. 6(b) Means used for the DM

5. Discussion

Based on these results, and concerning the planning phase, most respondents demonstrated a real foresight about the impact of the environment on students' metacognitive development and about the need to prepare it and create all the conditions leading to this development. In addition, more than half of the teachers identified all the tasks mentioned as important to consider when planning the sessions. However, the rest ignore the importance of their role as mediators in the planning phase, which cannot pass without consequences since it is a necessary condition for the success of the metacognitive educational interventions.

The responses were disparate about the difficulties most encountered by teachers in creating an environment conducive to metacognitive development in their students. However, the condition that seems most difficult to achieve for most of the teachers (42%) was the formalization of metacognitive breaks given the time required to complete them. In the same vein, [9] suggests that time should first be allowed for metacognitive breaks during activity so that students become aware of their metacognitive experiences and the mental mechanisms they implement.

Concerning the teaching techniques used to develop metacognition in their students, the participants' responses were very close, indicating that (71%) of the teachers reported using all three teaching techniques: (a) schematics; (b) modeling; and (c) feedback-communication. In this perspective, [7] report that schemas, modeling, and feedback-communication are intervention units conducive to metacognitive development.

In the facilitation phase, [14] explain that in the context of metacognitive development in students, the teacher begins, during his/her presentations and demonstrations in class, with modeling, where he/she strives to make any implicit reasoning explicit, so he/she teaches what to do, how, when, where and why to do it. However, various difficulties can disrupt the accomplishment of this practice. This study confirms this observation since more than 88% confirmed that they find it difficult to implement it and that lack of time is the main obstacle. However, only 12.5% of all respondents reported that their modeling practice went smoothly.

In addition, in the second stage, the guided practice, it is for the teacher to adjust or refine his or her approach to make it metacognitive. To consider how and in what ways they can manage it to feel that their sense of competence is growing by constantly self-evaluating [8]. In this context, four strategies are useful for establishing a structure in teacher-student dialogue: summary, self-questioning, clarification, and prediction [3]. Based on the results, almost just a third (1/3) of the teachers respect the four strategies. On the other hand, the prediction of learning difficulties remains the least considered by the rest.

The third step in the facilitation phase is a collaborative practice. In this step, the teacher organizes his or her class into sub-groups, and each sub-group includes a leader who uses the strategies and encourages other sub-group members to use them [5]. Meanwhile, others observe or listen, and they are invited to take a critical look at the others' approach, make comments, and provide suggestions for action [7]. In this study, the results reveal that nearly two-thirds (2/3) of the participants meet the three-fourths (3/4) of the sub-steps. However, asking leaders of the existing groups to use learning strategies and encouraging other members of the subgroup to use them is lacking in this practice.

The last step in the animation phase is the independent practice, during which students reinvest on their own, with the help of their questioning plan, what they understood from the modeling and applied in the team during the guided practice in some problems or questions. More than half of the teachers identified the three mentioned goals when processing the autonomous practice on the students' part. This shows their awareness of the importance of this stage, as the culmination of the previous ones, and its role in

developing students' autonomy in taking charge of their learning.

The evaluation phase noted from the results received that metacognition evaluation is part of the formative evaluation framework for more than half of the respondents. However, 3% of the total respondents include it in the summative framework, and the rest stated that they practice both formative and summative.

Compared to the means used to develop metacognition in students, most teachers opted for note-taking as the most common method used in this context. The portfolio and concept map were the third means and remain poorly used, almost similar to the logbook used by 6% of respondents.

In this context, several authors argue that the teacher can use various tools to stimulate the development of metacognition: note-taking [6], logbook [4]; concept map [7]; the portfolio [12], and other tools.

6. Conclusion

This research reveals that it is impossible to hypothesize a spontaneous metacognitive attitude intrinsically linked to having I/O experiences. Nevertheless, metacognition remains a skill to be gradually built among students. It is more a pedagogical tool that teachers use to help their students learn than a "natural" activity inherent in the act of learning.

Therefore, it is not enough for students to multiply learning experiences to engage in metacognitive reflection simultaneously. On the contrary, it must be caused by the teacher's pedagogical system developed for this purpose.

Through these approaches, the teacher must lead students to make a personal judgment on the mastery of their resources and strategies by reinforcing self-assessment, which contributes to the development of metacognitive skills [11]. Training students to regulate their thinking and learning processes [10] do this.

Encouraging students to develop their metacognition is not always easy for teachers. They complain of a lack of practical tools and, on the other hand, that metacognitive breaks can be associated with time loss [3].

The success of a metacognitive intervention depends mainly on the quality of these devices. At the end of this work, it is essential to recall that the present study constitutes a draft to overcome the shortcomings in the development of metacognition in paramedical studies. This is the first study carried out in Morocco interested in exploring this approach by teachers who wish to generalize it in all country institutions.

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